BIOMASS FEASIBILITY

Presented by

American Development Institute

TOPICS

- Why Do it?
- Typical Project Opportunities for Municipalities
- Economic Analysis
- Design Considerations

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Why Do it?

- Economics
  - Annual Budget Savings
  - Lowest Life Cycle Cost
- Energy Independence
  - Fuel Diversity (Wood, Oil and Gas)
  - Minimize fuel commodity risk
- Reduce Carbon Footprint
  - Typical HS – equivalent to removing over 580 vehicles for 30 years

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Other Alternatives

- Energy Conservation
- CHP

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Consistent Issues

- **Where are gas/oil prices headed?**
  - Create Scenarios show the sensitivity
- **Is there enough Wood locally?**
  - Enough wood locally provide for 600 projects
- **Where are wood prices headed?**
  - Historical prices - flat, current prices -Up 20% this year.

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Issues to understand

- Requires more attention by staff
- Require 50% more deliveries than Oil
- More moving parts
  - Augers etc.

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Typical Project Opportunity for Municipalities

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Commodity Market Issues

Wood is significantly cheaper than Fossil Fuel

$/MMBTU	Wood Price	Nat Gas Price	#6 Oil Price
	$/Ton	$/DTherm	$/Gal
$ 2.94	$ 30	$ 2.94	$ 0.41
$ 3.92	$ 40	$ 3.92	$ 0.54
$ 4.90	$ 50	$ 4.90	$ 0.68
$ 5.88	$ 60	$ 5.88	$ 0.82
$ 6.86	$ 70	$ 6.86	$ 0.95
$ 7.84	$ 80	$ 7.84	$ 1.09
$ 8.82	$ 90	$ 8.82	$ 1.22
$ 9.80	$ 100	$ 9.80	$ 1.36
$ 10.78	$ 110	$ 10.78	$ 1.50
$ 11.76	$ 120	$ 11.76	$ 1.63
$ 12.75	$ 130	$ 12.75	$ 1.77
$ 13.73	$ 140	$ 13.73	$ 1.90
$ 14.71	$ 150	$ 14.71	$ 2.04
$ 15.69	$ 160	$ 15.69	$ 2.18
$ 16.67	$ 170	$ 16.67	$ 2.31
$ 17.65	$ 180	$ 17.65	$ 2.45
$ 18.63	$ 190	$ 18.63	$ 2.58
$ 19.61	$ 200	$ 19.61	$ 2.72
$ 20.59	$ 210	$ 20.59	$ 2.86
$ 21.57	$ 220	$ 21.57	$ 2.99
$ 22.55	$ 230	$ 22.55	$ 3.13
$ 23.53	$ 240	$ 23.53	$ 3.26
$ 24.51	$ 250	$ 24.51	$ 3.40
$ 25.49	$ 260	$ 25.49	$ 3.54
$ 26.47	$ 270	$ 26.47	$ 3.67
$ 27.45	$ 280	$ 27.45	$ 3.81
$ 28.43	$ 290	$ 28.43	$ 3.94
$ 29.41	$ 300	$ 29.41	$ 4.08
$ 30.39	$ 310	$ 30.39	$ 4.22

Current Price for Commodity

Wood is 1/3 the cost of Natural Gas

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Criteria for site selection

	Least potential → Greatest potential			
Criterion	1	2	3	4
Proximity to biomass fuel supply	National	Within 40m	Sub regional	Local
Sustainability of transport supply				No traffic issues
Proximity to heat loads	1-3m	1-0.5m	0.5-0.1m	0.1-0m
Interest from owner	Ambivalent	Neutral	Interested	Enthusiastic

Area of presentation focus

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Typical Project Economics

Fixed and variable construction costs dictate the economics

Building Type	Size ('1000 Sqft)	Typical Energy Intensity (mbtu/sqft)	Post ECM Energy Intensity (mbtu/sqft)	Annual Budget After ECM('000)	Max Potential Biomass Savings	Typical Installed Cost ('000)	Payback (yrs)
Public Garage	60	45	30	$ 27	$ 14	$ 175	12.1
Library	40	80	50	$ 30	$ 16	$ 450	28.0
Town Hall	30	78	45	$ 20	$ 11	$ 450	41.4
Fire Station	10	98	53	$ 8	$ 4	$ 450	105.5
Elementary School	42	58	42	$ 26	$ 14	$ 450	31.7
Middle School	80	72	48	$ 58	$ 31	$ 550	17.8
High School	250	78	55	$ 206	$ 111	$ 850	7.7

If wood is not free - first "right size" the wood chip facility.

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Sample Facility: Typical High School

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Typical High School Characteristics

- Larger Building
- Longer Operating Hours
- Higher Energy usage /sqft
- Usually boiler plant away from main bldg
- Steam or Hydronic heating for easy integration
- Larger Parking area (for fuel deliveries)

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Design Issues to Consider

- Fuel Sourcing
- Truck delivery logistics
- Storage Size and Type
  - Silo or “walking floor”
- Boiler types
  - Grate system (moving or non-moving)
- Operating Conditions
  - Base load existing system
- Emissions
  - Multi-Cyclone or Bag house

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Location issues

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Typical Installation – Fuel Storage Considerations

Quabbin - Underground

Silo

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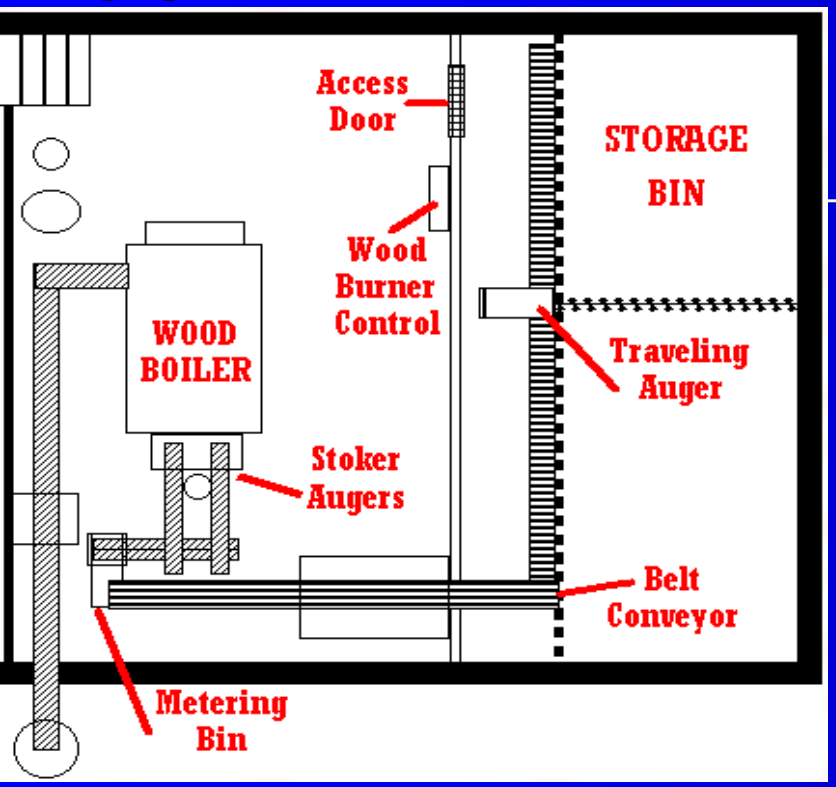
Typical Installation – Inside the building



Carbon Footprint Reduction

Up to an 87% reduction in Carbon footprint related to heating source

Building Type	Size ('1000 Sqft)	Tons CO2 Displaced over life (Natural Gas)	Tons CO2 Displaced over life (Oil)	Equivalent Vehicles removed from road for 30 years
Public Garage	60	9,485	13,070	74
Library	40	11,242	15,490	88
Town Hall	30	8,220	11,327	64
Fire Station	10	3,443	4,744	27
Elementary School	42	8,558	11,792	67
Middle School	80	20,235	27,882	158
High School	250	68,504	94,393	535

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Thank you.

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